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Worksheet for Basic Stoichiometry

Part 1: Mole ←→ Mass Conversions

Convert the following number of moles of chemical into its corresponding mass in grams.

1. 0.436 moles of ammonium chloride
2. 2.360 moles of lead (II) oxide
3. 0.031 moles of aluminum iodide
4. 1.077 moles of magnesium phosphate
5. 0.50 moles of calcium nitrate

Convert the following masses into their corresponding number of moles.

6. 23.5 g of sodium chloride
7. 0.778 g of sodium cyanide
8. 0.250 g of water
9. 169.45 g of calcium acetate
10. 79.9 g of potassium permanganate

Part 2: Moles ←→ Number of Particles Conversions

Convert the following number of moles into their corresponding number of particles.

11. 0.0455 moles of hydrochloric acid
12. 1.2 moles of glucose (C6H12O6)
13. 0.32 moles of sodium bicarbonate

Part 3: Solve the following stoichiometry grams-grams problems:

1) The combustion of a sample of butane, C_4H_{10} (lighter fluid), produced 2.46 grams of water.

$$2\ C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$$

(a) How many moles of water formed?
(b) How many moles of butane burned?
(c) How many grams of butane burned?
(d) How much oxygen was used up in moles?
(e) How much oxygen was used up in grams?

2) Using the following equation: $2\ NaOH + H_2SO_4 \rightarrow 2\ H_2O + Na_2SO_4$

How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid? **(ANSWER 355.3g Na_2SO_4)**

3) Using the following equation: $Pb(SO_4)_2 + 4\ LiNO_3 \rightarrow Pb(NO_3)_4 + 2\ Li_2SO_4$

How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

4) Using the following equation: $Fe_2O_3 + 3\ H_2 \rightarrow 2\ Fe + 3\ H_2O$

Calculate how many grams of iron can be made from 16.5 grams of Fe_2O_3 by the following equation.

5) Using the following equation: $2\ I_2 + KIO_3 + 6HCl \rightarrow 5ICl + KCl + 3H_2O$

Calculate how many grams of iodine are needed to prepare 28.6 grams of ICl by this reaction.

6) Using the following equation:

$5\ KNO_2 + 2\ KMnO_4 + 3\ H_2SO_4 \rightarrow 5\ KNO_3 + 2\ MnSO_4 + K_2SO4 + 3\ H_2O$

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How many moles and how many grams of $KMnO_4$ are needed to carry out this reaction on 11.4 grams of KNO_2?

7) Using the following equation: $4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$

How many moles and how many grams of oxygen (O_2) are needed to react with 56.8 grams of ammonia by this reaction?

8) Using the following equation: $NaIO_3 + 6\ HI \rightarrow 3\ I_2 + NaI + 3\ H_2O$

Calculate the number of moles and the number of grams of iodine (I_2) that can be made this way from 16.4 grams of $NaIO_3$.

9) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

a. How many grams of HCl are consumed by the reaction of 2.50 moles of magnesium?
b. What is the mass in grams of H_2 gas when 4.0 moles of HCl is added to the reaction?

10) Acetylene gas (C_2H_2) is produced as a result of the following reaction.

$$CaC_2(s) + 2H_2O(l) \rightarrow C_2H_2(g) + Ca(OH)_2(aq)$$

a. If 3.20 moles of CaC_2 are consumed in this reaction, how many grams of H_2O are needed?
b. How many grams of $Ca(OH)_2$ would be formed with 3.20 moles of CaC_2?

11) Acetylene gas, C_2H_2, is used in welding, produces an extremely hot flame when it burns in pure oxygen according to the following reaction.

$$2\ C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(g)$$

How many moles of water (H_2O) are produced when 25.0 grams of C_2H_2 burns completely?

12) $3\ Mg + 1\ Fe_2O_3 \rightarrow 2\ Fe + 3\ MgO$

How many moles of iron, Fe, are produced with 25.0 grams of magnesium, Mg?

13) Laughing gas (nitrous oxide, N_2O) is sometimes used as an anesthetic in dentistry.

$$NH_4NO_3(s) \rightarrow N_2O(g) + 2H_2O(l)$$

a. How many moles of NH_4NO_3 are required to produce 33.0g of N_2O?
b. How many moles of water are produced with 45.0g of N_2O?

Part I3

1. a. 0.137mol H_20 b. 0.0273 mol C_4H_{10} c.1.59g C_4H_{10} d.0.178mol O_2 e. 5.69 g O_2
3. 386.3g of $LiNO_3$ 9. a 182g HCl b.4.0g H_2 10. a. 115g H_20 b. 237g $Ca(OH)_2$
11. 0.960 moles H_20 12. 0.686 mole Fe 13. a. 0.749 mole NH_4NO_3 b. 2.04 mole H_2O